Application No.: 10/709,008
Docket NO.:9003-US-PA
Customer No. 31561

Specification Amendments

Please amend the specification as follow:

[0005] Polysilicon and amorphous silicon are two types of materials used for fabricating TFT for active matrix LCD panels. Polysilicon TFT has a higher aperture rate and a lower cost than the amorphous silicon TFT. The larger and uniform silicon grains of polysilicon allow electrons to flow more freely than through amorphous silicon, which is made up of smaller and random sized silicon grains. It allows the normally external driver chips to be fabricated on the glass substrate that dramatically reduces row and column connections. Hence, polysilicon TFT technology can effectively reduce the device size in order to achieve higher integration. Generally, the requirements for mass production of polysilicon TFT are low temperature polysilicon ("LTPS") technology (450-550°C), low temperature film-forming technology for the isolating film of gate terminal, and ion implantation for large area.

[0006] For application to active matrix liquid crystal displays, a low temperature process for the production of polycrystalline silicon is required to permit the use of inexpensive glass substrates. This would allow the integration of drive electronics into the display panel. Current low temperature processes include solid phase crystallization ("SPC") and excimer laser crystallization ("ELC"). Solid phase crystallization requires high temperatures (600°C) and the

result of the crystallization is not very ~~well~~good. Excimer laser crystallization technology applies the excimer laser in excimer laser crystallization or excimer laser annealing ("ELA") process to fuse the amorphous silicon thin film and make it recrystallize to a polysilicon thin film.

[0007] Because the ELC process can be carried out at a temperature lower than 450°C, resulting in a higher electron migration rate and a lower leakage current than the SPC process, ~~and therefore~~ it can be applied to an inexpensive glass substrate. Therefore, the production costs can be reduced.

[0023] Referring to FIG.2C, the fused portion of the amorphous silicon layer 204 uses the unfused amorphous silicon grains 207 as crystallization seeds to crystallize and then a polysilicon layer 208 having a thickness of D2 is formed; wherein D2 is approximately between 1nm and 1000nm. As shown in FIG.2C, during the crystallization process, the silicon grains will continue to grow laterally until they contact to the neighboring silicon grains. Furthermore, the boundary 210 between the silicon grains will become protrusions 212 because the neighboring silicon grains push against each other. Generally, the heights of those protrusions 212 will distribute in a different way_based on the distance between the two neighboring silicon grains, the temperature of the amorphous silicon layer 204 after the excimer laser is applied, or the growth rate of the silicon grains.

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[0025] As shown in ~~FIG. 2C and~~ FIG.2E, a second annealing process 218 is performed, wherein the second annealing process 218 can be performed by applying the excimer laser to a portion of the amorphous silicon layer 214 to liquidize the amorphous silicon layer 214 and the polysilicon layer 208 to become a liquid silicon layer 220; there are still some unfused silicon grains 222 left on the surface of the isolating layer 202. The energy density of the excimer laser depends on the heights of the amorphous silicon layer 214, the polysilicon layer 208, and the protrusions 215. By controlling the energy density of the excimer laser, a thickness lower than Z_1 of the amorphous silicon layer 214 and the polysilicon layer 208 is fused in part, wherein $Y_1 < Z_1 < X_1$. At the same time, the portion of the protrusions 215 with the distance, which is between the top of the protrusions 215 and the substrate 200 and higher than Z_1, are not fused completely and become a plurality of silicon grains 222. The number of the silicon grains 222 is less than that of the protrusions 212.